We give in Table XIV the differences between the calculated and observed values of the evaporation by these two formulæ.

In the means for the period 1904–1908, the calculated and observed values coincide pretty well.

(6) In his "Lehrbuch der Meteorologie" Prof. J. von Hann gives the following formula of the velocity of evaporation:

Dalton's formula

$$\frac{dv}{dz} = A(E-e),$$

where v is the amount of evaporation from water surface; z, time; E, maximum vapor pressure; e, actual vapor pressure; A, a constant.

Weilenmann and Stelling put the evaporation rate proportional to the wind velocity. On the other hand, De Heen, Shierbeck and Svenson assumed that the evaporation is proportional to the square root of the wind velocity. Moreover, they introduced T: T_0, or $(1+\alpha t)$, into their evaporation formula.

Trabert puts

$$v = c(1+\alpha t)(E-e)\sqrt{W},$$

where W is the wind velocity; c, the constant depending upon atmospheric pressure. When the mean pressure is B and the current pressure b, then c becomes

$$c \times \frac{b}{B}.$$

Dalton's formula is identical with that which I have deduced theoretically in this note. For formula (10) is

$$dH = \alpha(p_1 - p_2).$$

But formula (10) and Dalton's formula do not represent the observed values.

TABLE XIV.—*Differences between the observed evaporation, M, and the values calculated by formulæ (A) and (B).*

	Jan.	Feb.	Mar.	* Apr.	May.	June.
1904.						
M	1.33	1.52	1.41	1.47	1.73	2.00
By (A)	–0.09	0.13	0.15	0.30	0.38	0.26
By (B)	0.03	0.14	0.11	0.26	0.29	0.15
1905.						
M	1.22	1.42	1.08	1.44	2.36	0.85
By (A)	–0.03	–0.12	0.04	0.10	0.03	–0.11
By (B)	–0.03	–0.06	0.00	0.05	–0.01	–0.12
1906.						
M	1.30	1.21	1.62	1.96	1.43	1.14
By (A)	–0.23	–0.12	0.13	–0.19	0.26	0.17
By (B)	–0.12	–0.03	0.20	0.16	0.23	0.23
1907.						
M	1.37	1.16	1.40	1.76	3.04	1.74
By (A)	0.00	–0.10	0.21	0.25	–0.72	–0.04
By (B)	0.03	–0.06	0.21	0.19	–0.29	–0.16
1908.						
M	1.48	1.21	1.51	1.43	2.13	1.69
By (A)	–0.06	0.01	–0.03	0.24	0.09	–0.09
By (B)	0.00	–0.01	0.03	0.19	0.01	0.21
Mean.						
M	1.34	1.30	1.40	1.61	2.14	1.48
By (A)	–0.08	–0.04	0.10	0.17	0.01	0.04
By (B)	–0.02	0.00	0.11	0.17	0.05	–0.02

TABLE XIV.—*Differences between the observed evaporation, M, and the values calculated by formulæ (A) and (B)*—Continued.

	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.						
M	1.83	2.45	1.66	1.40	2.25	1.97
By (A)	–0.21	–0.21	–0.19	0.08	–0.04	–0.33
By (B)	–0.35	–0.39	–0.30	0.02	0.03	–0.09
1905.						
M	1.81	1.31	2.13	1.70	1.92	1.47
By (A)	–0.24	–0.12	0.23	0.05	0.02	0.00
By (B)	–0.39	–0.27	0.10	–0.06	0.12	0.05
1906.						
M	1.33	1.57	1.19	1.52	1.54	1.77
By (A)	0.23	0.05	–0.12	–0.12	–0.20	–0.47
By (B)	0.46	0.14	–0.18	–0.18	–0.24	–0.16
1907.						
M	1.55	1.92	1.14	1.73	1.45	1.98
By (A)	–0.01	–0.02	0.17	0.44	0.12	–0.43
By (B)	0.05	0.03	–0.26	0.48	0.03	–0.15
1908.						
M	1.51	1.88	2.05	1.59	2.41	1.87
By (A)	0.25	0.04	–0.27	–0.07	–0.20	–0.09
By (B)	0.32	0.05	–0.36	–0.18	0.31	–0.12
Mean.						
M	1.61	1.83	1.63	1.59	1.91	1.81
By (A)	0.00	–0.06	–0.04	0.08	–0.06	–0.26
By (B)	0.00	–0.09	–0.20	0.02	–0.05	–0.09

Weilenmann and Stelling assume that M varies as W, and De Heen, Shierbeck and Svenson that M varies as $\sqrt{W}$. Their formulæ give us almost the same results in my calculations. My parabolic and linear formulæ hold good equally.

Therefore it may be concluded that evaporation in the shade may be fairly well represented by the formulæ of either Weilenmann, Stelling, De Heen, Shierbeck, Svenson, Trabert, or myself. But the evaporation in open air can not be represented by those formulæ.

It seems to me that there remains an ample field for further research.

EDITOR'S NOTE.—Various papers bearing on evaporation by Ferrel, Russell, Marvin, and others will be found in the MONTHLY WEATHER REVIEW and other publications of the United States Weather Bureau. An elaborate Annotated Bibliography of Evaporation, by G. J. Livingston, appeared in the MONTHLY WEATHER REVIEW from June, 1908, to June, 1909, and also reprinted.

A valuable summary of our knowledge of the laws of evaporation, for the period 1840 to 1892, will appear in the MONTHLY WEATHER REVIEW for March, 1914.

PREVENTION OF FOG.

By pouring oil on the disturbed ocean surface ship captains have often been able to greatly diminish the damage that would have otherwise resulted during severe storms. M. Georges Onofrio, director of the Fulviére Observatory, at Lyon, France, suggests that by pouring oil upon inland rivers and lakes we may check the evaporation and therefore the formation of fog. Experiments have been made on this subject by allowing a mass of tow moistened with a small quantity of oil to dip into a running stream of water. Thus an oily coating scarcely a millionth of an inch in thickness, spreads over the inland waters. If successful the 62 days of local fog should be replaced by 62 days of good weather annually. A mineral oil is the cheapest but animal and vegetable oils have some advantages. It is estimated that the total expense for the region that furnishes objectionable fogs in the neighborhood of Lyon will amount to about $30 a day.

Too much must not be expected from this proposed use of oil since many regions in the United States owe the occurrence of fog, not so much to the evaporation from water surfaces and cultivated land surfaces and forest surfaces, but principally to the cooling of the lower atmosphere which has derived its moisture from great distances. The cooling that produces the fog is due to radiation from the lower atmosphere upward through clear air into space beyond.

Such cooling will produce fog even in regions that are quite dry, providing the atmosphere has brought a little moisture thither from a distance. In the case under consideration at Lyon, cold dry winds from the north and east allow of low temperatures near the ground and dry air just above it. In such a case as Pittsburgh we have evaporation from warm river water at the base of a deep ravine, clear cool air above the ravine. In the case of San Francisco we have relatively cold water pushed up along the coast and clear cold air above it. In all these cases the hydrographic and atmospheric conditions are far more important than the evaporation from local rivers.—[C. A.]

DO CLOUDS YIELD SNOW EASIER THAN RAIN?

Mr. Douglas F. Manning, of Alexandria Bay, N. Y., under date of January 11, 1914, propounds the above question and adds:

After many years of observation it has seemed apparent to me that they do; in other words, a cloud will precipitate snow, which under the same conditions, but dew-point above freezing, no rain would result. This seems to apply to the lower clouds, especially those of the strato-cumulus type which are seen with the westerly and northerly winds during winter a little while after the passage of a "low." These clouds are generally very shallow and in long rolls (such appearance helped, no doubt, by perspective) but from such clouds copious flurries of feathery snow fall. This same type of cloud occurs in the summer time but of much larger growth without causing the least suggestion of rain.

At the beginning of a well-developed cold wave a peculiar form of cloud accompanies the west and northwest winds, having all the appearance of an alto-stratus formed at the strato-cumulus level, and which produces the same optical effect as the alto-stratus, namely, a bright patch of light in the vicinity of the sun or moon but no halo. In fact, *perhaps this is an alto-stratus at a low level owing to extreme cold.* From this cloud a fine powdery snow falls, which is so fine that it sifts through any crevice or crack in windows and doors. Such clouds, although of much greater altitude and thickness in summer, do not even yield a drizzle. Lastly, there is a form of high alto-cumulus that is most common during periods of calm cold weather, especially when an area of low barometer is forming far to the southwest. This cloud is of a very flimsy nature, so much so that the sun or moon can be seen shining feebly, although perhaps surrounded by a corona, from which the air is filled with a feathery snow of most beautiful formation but which is so fine a texture that one wonders what becomes of it all. This cloud appears in the summertime in large fleecy battalions but no shower will fall.

It seems to me that the process of snow building is such that a large feathery snowflake can grow from a given amount of water vapor and reach the earth with but little loss from evaporation, whereas, under the same conditions but higher temperature, it would be impossible for raindrops of sufficient size to form or ever reach the ground.

There is a strange form of snow which occasionally falls and so far I have never read any explanation of it. I do not mean the frozen drops of rain, termed sleet, of which the pellet is clear ice; but of a compact pellet of snow about the size of a pea and which generally falls during squally weather, especially in March and April up here, but I have seen it in other States.

I am highly interested in the weather and once planned to take the observers' examination, but circumstances would not permit, so content myself with a homemade observatory where I spend spare hours after my day's work in a printing office. * * *

Having watched the clouds for years, it always mystified me why the cirrus should take such totally different forms from those of the lower levels. I contented myself with the idea that their being composed of ice dust produced this effect, but such an idea was dispelled in March, 1912, when I observed several fogs during severe, calm, cold days with the temperature 20° below zero (−20° F.), in which such fog particles were composed of ice spiculae and produced the same optical effect as cirrus and cirro-stratus, namely, a large halo around the sun, which in this case could only be a few feet from the observer. These fogs occurred in the early morning during periods of anticyclonic weather and were very local; when viewed from a distance they had no different appearance from those fogs that are formed in the spring and fall under similar conditions; so it seemed very apparent that the frozen condition could not be called upon to explain the varied formations of cirrus clouds, although, of course, the conditions of temperature and especially pressure are widely different between the frozen fog and the cirrus cloud. * * * This phenomenon is quite common in this part and nearly always occurs with rising barometer and light or diminishing north winds, the cloud sheet moving slowly from the same [northerly] direction. Under such conditions the sky is clear far to the north, as if it were, so to speak, the boundary line between the high and low, for clear weather soon follows, with lower temperature. I am very positive that no rain could ever fall from such muslin-like clouds. * * * I will keep careful watch of the clouds, direction, etc., if such would be of any use.

During the past few days (Jan. 10–17, 1914), if you will examine the weather maps, you will see that severe cold has been prevailing in northern New York, while to the south and west much higher temperatures were prevailing with west and southwest winds. This warm current of air must have risen over the cold air which lay as a blanket over us, for it rained with the temperature between 18° and 22° F. on the 16th, but, of course, froze on the trees, covering them with ice.

NOTES.

Professor Hergesell, head of the Meteorological Institute of Strassburg, has been appointed director of the Aeronautical Observatory at Lindenberg, in succession to Professor Assmann.

Prof. A. A. Ivanov has been appointed director of the University Observatory at St. Petersburg.

Provision is to be made in connection with the French department of war for continuing the aerological work carried on by the late M. Léon Teisserenc de Bort, at his observatory at Trappes.

On account of the interest widely manifested by meteorologists in the relations between climate and agriculture, as well as between climate and forestry, we take pleasure in repeating the invitation to membership extended by the secretary of the American Forestry Association at Washington. The association endeavors to extend its influence as to forest conservation and development by increasing its membership.

We regret to notice the death of Prof. F. Pockels, of the University of Heidelberg, on August 29, 1913, at the age of 60 years. Prof. Pockels was deeply interested in the application of mathematical analysis to natural phenomena; his paper on the rainfall from air ascending a mountain side was published in the Monthly Weather Review for 1901, pages 152–159 and 306–307, and is almost the only attempt to explain the distribution of rain falling from a layer of air steadily ascending or descending.

A correspondent urges the introduction of a new thermometer scale, whose fiducial, or fixed points, shall be the freezing point of water as the zero point and the internal heat of the human body as 100°. It would